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EXAMINER
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ART UNIT	PAPER NUMBER
2114	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/767,640	WATANABE ET AL.
	Examiner	Art Unit	
	Joseph Schell	2114	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **3** MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *20 February 2005*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-23* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-23* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *29 January 2004* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

Claims 1-23 have been examined.

Claims 1-23 have been rejected.

Claim Objections

1.   Claim 8 is improperly dependent on claim 6. Due to the embodiment being claimed and the terminology used within the claim the examiner assumes claim 8 is instead dependent on claim 7.

2.   Claim 8 line 2 should read "remote direct memory access" without an "and" between "direct" and "memory".

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3.   Claims 1-6, 9-10, 12, 16-17, and 19-23 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4.   Claim 7 recites the limitation "the repaired storage appliance" in the eighth line of the claim. There is insufficient antecedent basis for this limitation in the claim.

5.   Claims 1, 4-5, 9-10, 16-17, 19 and 22-23 use the terms "GIVEWAIT state" and "MBWAIT state" that are not generally known in the art. What these states "signify" to

the surrounding system is given in the specification at the bottom of page 16 and the

middle of page 17, but the details of the states themselves are not explicitly defined.

Without an explicit definition within the specification these terms cannot be used in the

claims because they force the examiner to rely upon the implied effects of the states to

deduce limitations regarding the states themselves.

6.   Claims 3, 12 and 21 recite that a predetermined memory location comprises a

data structure. Memory locations are physical storage addresses and cannot comprise

a specific data structure because a data structure is at a higher level of abstraction.

These claims should be reworded to something similar to "wherein the predetermined

memory location comprises a memory of the repaired storage appliance and wherein

the GIVEWAIT state and MBWAIT state are stored in a state data structure within the

memory."

<div align="center">

Claim Rejections - 35 USC § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1-2, 4-7, 9-11, 13-20, and 22-23 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Deitz (US Patent 6,578,158) in view of Chen (US Patent

6,715,098).

8.   As per claim 1, Deitz ('158) discloses a method for coordinated bringup of a

repaired storage appliance in a storage appliance cluster (the coordinated bringup is

exemplified in column 3 lines 12-15), the repaired storage appliance having a disk

subsystem (column 5 lines 55-57 and column 5 lines 63-65, the WWN of a controller is

embedded in the firmware of the controller) the method comprising the steps of:

       sending a first message (column 6 lines 63-65);

       releasing disk reservations in response to the first message by a surviving

storage appliance (column 7 lines 25-30);

       initializing the disk subsystem of the repaired storage appliance (column 3 lines

56-62 and column 8 lines 7-11 a subsystem initialization is performed to record the

failed ID in the surviving storage so that it knows to receive data for the failed ID);

       sending a second message (column 8 lines 49-53); and

       performing a giveback operation by the surviving storage appliance in response

to detecting the second message (column 8 lines 54-58).

Deitz ('158) does not expressly disclose the system wherein messages are passed

regarding the status of storage appliances by writing to a predetermined location in

storage.

Chen ('098) teaches a system for inter-appliance failure signaling in the absence of a

direct signaling link. The two appliances communicate through writing to a commonly

accessible storage device (see abstract).

At the time of invention it would have been obvious to a person of ordinary skill in the art

to modify the storage appliance failover system disclosed by Deitz ('158) such that inter-

appliance communication is done by writing to a predetermined commonly accessible

storage location as taught by Chen ('098). This modification would have been obvious

because adaptively routing inter-appliance communication would require costly software

and valuable memory and processing time to manage (Chen ('098) column 1 lines 65

through column 2 line 2). Additionally, it would be obvious to one of ordinary skill in the

art that communicating through storage messaging as taught by Chen ('098) would

allow the system depicted in Deitz ('158) figure 1 to omit the communication channel

(element 205).

9.   As per claim 2, Deitz ('158) in view of Chan ('098) discloses the method of claim

1 further comprising the steps of:

        completing the repaired storage appliance initialization (Deitz ('158) column 9

lines 18-24); and

        processing data access requests by the repaired storage appliance (Deitz ('158)

column 9 lines 7-10).

10. As per claim 4, Deitz ('158) in view of Chan ('098) discloses the method of claim 1 wherein the surviving storage appliance detects the GVEWAIT state by performing a remote direct memory access read operation to the predetermined memory location (Chan ('098) column 5 lines 18-21 describe the storage device as being a RAID, CDROM or tape, all of which are external devices and therefore remotely accessed for reading and writing).

11. As per claim 5, Deitz ('158) in view of Chan ('098) discloses the method of claim 1 wherein the surviving storage appliance detects the MBWAIT state by performing a remote direct memory access operation of the predetermined memory location (Chan ('098) column 5 lines 18-21 describe the storage device as being a RAID, CDROM or tape, all of which are external devices and therefore remotely accessed for reading and writing).

12. As per claim 6, Deitz ('158) in view of Chan ('098) discloses the method of claim 1 wherein the surviving storage appliance ceases to process data access requests directed to the repaired storage appliance after performing the giveback operation (Deitz ('098) column 9 lines 1-11).

13. As per claim 7, Deitz ('158) discloses a storage appliance for use in a storage system cluster, the storage appliance comprising:

A storage operating system (computer program, as noted at the end of the abstract) having a cluster failover layer adapted to perform a coordinated bringup operation in association with a partner storage appliance (the coordinated bringup is exemplified in column 3 lines 12-15), wherein the coordinated bringup operation comprises the steps of:

(i) sending a first message (column 6 lines 63-65);

(ii) initializing a disk subsystem of the repaired storage appliance in response to detecting a release of disk reservations by a partner storage appliance (column 3 lines 56-62 and column 8 lines 7-11 a subsystem initialization is performed to record the failed ID in the surviving storage so that it knows to receive data for the failed ID. This is after the disk releasing by the failing storage to give the other storage control, see column 7 lines 25-30);

(iii) sending a second message (column 8 lines 49-53);

(iv) processing data access requests directed to the storage appliance after a giveback operation performed by the partner storage appliance (column 8 lines 54-58 describes the giveback operation and column 9 lines 15-18 mentions the resumption of dual storage applicant operation); and

whereby a period of time during which clients of the storage system are without connectivity is minimized (column 1 lines 40-48, transparency is achieved through a lack of storage system down-time, also see column 8 lines 7-12).

Deitz ('158) does not expressly disclose the system wherein messages are passed

regarding the status of storage appliances by writing to a predetermined location in

storage.

Chen ('098) teaches a system for inter-appliance failure signaling in the absence of a

direct signaling link. The two appliances communicate through writing to a commonly

accessible storage device (see abstract).

At the time of invention it would have been obvious to a person of ordinary skill in the art

to modify the storage appliance failover system disclosed by Deitz ('158) such that inter-

appliance communication is done by writing to a predetermined commonly accessible

storage location as taught by Chen ('098). This modification would have been obvious

because adaptively routing inter-appliance communication would require costly software

and valuable memory and processing time to manage (Chen ('098) column 1 lines 65

through column 2 line 2). Additionally, it would be obvious to one of ordinary skill in the

art that communicating through storage messaging as taught by Chen ('098) would

allow the system depicted in Deitz ('158) figure 1 to omit the communication channel

(element 205).

14.   As per claim 9, Deitz ('158) in view of Chen ('098) discloses the storage

appliance of claim 8 wherein the second state comprises a MBWAIT state (Deitz ('158)

column 7 lines 50-54, the resetting causes the hub to switch routing configurations so that all signals route to the surviving controllers, thus it is a state within the hub).

15.   As per claim 10, Deitz ('158) in view of Chen ('098) discloses the storage appliance of claim 8 wherein the first state comprises a GIVEWAIT state (Deitz ('158) column 7 lines 27-30 the surviving controller takes over the disk access port of the failed controller and a reset signal is asserted by the survivor, see column 7 lines 48-49).

16.   As per claims 11 and 19, these claims recite limitations found within claim 1 and are rejected on the same grounds as claim 1.

17.   As per claims 13 and 22, claims recite limitations found within claim 4 and are rejected on the same grounds as claim 4.

18.   As per claims 14 and 23, these claims recite limitations found within claim 5 and are rejected on the same grounds as claim 5.

19.   As per claim 15, this claim recites limitations found within claim 6 and is rejected on the same grounds as claim 6.

20.   As per claims 16 and 17, these claims recite limitations found within claims 9 and 10 and are rejected on the same grounds as claims 9 and 10.

21.   As per claim 18, Deitz ('158) in view of Chen ('098) discloses the method of claim

11 wherein the set of disk reservations comprises small computer systems interface

reservations (Chan ('098) column 5 lines 25-28 the links between controllers and the

common storage may be SCSI links).

22.   As per claim 20, this claim recites limitations found within claim 2 and is rejected

on the same grounds as claim 2.

23.   Claims 3, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Deitz ('158) in view of Chen ('098) and in further view of Schwab (US Patent

4,543,627).

24.   As per claim 3, Deitz ('158) in view of Chen ('098) discloses the method of claim

1. Deitz ('158) in view of Chen ('098) does not disclose the method wherein the

predetermined memory location comprises a state data structure within a memory of the

repaired storage appliance.

Schwab ('627) teaches a system wherein inter-processor communication is performed

by writing to memory located at each processor via an interface unit (column 2 lines 3-

10). Data stored must be in some form of a data structure to be interpreted upon

receipt or reading.

At the time of invention it would have been obvious to a person of ordinary skill in the art

to modify common storage inter-processor messaging performed by Deitz ('158) in view

of Chen ('098) such that messaging is done using memory local to each processor as

taught by Schwab ('627). This modification would have been obvious because it allows

for a very low overhead per message (Schwab ('627) column 1 lines 39-45) and

decreases delays caused by intermediate storage operations (Schwab ('627) column 1

lines 59-64).

25.   As per claims 12 and 21, these claims recite limitations found within claim 3 and

are rejected on the same grounds as claim 3.

26.   Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deitz

('158) in view of Chen ('098) and in further view of Sugahara (US Patent 6,804,673).

Deitz ('158) in view of Chen ('098) discloses the storage appliance of claim 7. In the

system disclosed by Deitz ('158) in view of Chen ('098) state messages are conveyed

using polling or pinging (Deitz ('158) column 6 lines 65-67) or messaging through a

common storage device (Chen ('098) see abstract).

Deitz ('158) in view of Chen ('098) does not disclose the storage appliance wherein the

cluster failover layer is further adapted to perform routine remote direct and memory

access read operations to the partner storage appliance to detect a state of the partner

storage appliance.

Sugahara ('673) teaches the use of RDMA for inter-processor communication

messages (column 1 lines 21-24).

At the time of invention it would have been obvious to a person of ordinary skill in the art

to modify the system inter-controller communication system disclosed by Deitz ('158) in

view of Chen ('098) to allow for RDMA to be used for inter-controller communication

messages. This modification would have been obvious because RDMA communication

requires no operating system support and allows for a low message overhead

(Sugahara ('673) column 1 lines 23-26).

Conclusion

The prior art made of record on accompanying PTO 892 form and not relied upon is

considered pertinent to applicant's disclosure. Specifically, McKean ('339) teaches a

storage controller failover system with a similar communication scheme to Deitz ('158)

and Talagala ('289) teaches a storage controller failover wherein failover managing

software is executed by a disk controller processor.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Schell whose telephone number is (571) 272-8186. The examiner can normally be reached on Monday through Friday 9AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Scott Baderman can be reached on (571) 272-3644. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JS

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